USSN 10/724,248
Art Unit 1742

CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that this paper is being facsimile transmitted to the USPTO at (571) 273-8300 on the date shown below.

March 21, 2007
Date

Francis C. Hand

Art Unit 1742

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner:	Smith, Nicholas A.
Applicants:	Richard Phillips et al
Serial No:	10/724,248
Filed:	November 28, 2003
Title:	Process For Complex Transient Liquid Phase Sintering of Powder Metal

Customer No.:27192

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This is an appeal from the Final Rejection dated October 26, 2006 of claims 1 to 10.

Please charge the filing fee of $500.00 and any additional fees to Deposit Account 03-0678.

03/22/2007 TL0111 00000072 030678 10724248
01 FC:2402 250.00 DA

TABLE OF CONTENTS

REAL PARTY IN INTEREST

The real parties in interest are Material Technologies Inc., an assignee of record pursuant to an Assignment recorded as of July 21, 2006 under Reel 017971 and Frame 0363, and Richard Phillips, an individual named inventor.

RELATED APPEALS AND INTERFERENCES

There are no related Appeals or Interferences.

STATUS OF CLAIMS

Claims 1 to 10 have been rejected and are under appeal.

Claims 11 to 24 have been withdrawn pursuant to a Final Requirement for Restriction.

STATUS OF AMENDMENTS

All Amendments have been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1

Claim 1 is directed to a process in which particles of a metal powder are first mixed with (1) a lubricant having a characteristic of becoming liquid under pressure and of evaporating under a sintering temperature and (2) at least one liquid phase former to form a mixture. (Page 1, lines 17 to 19; page 4, lines 13 to 17)

Thereafter, the mixture is compressed at a pressure sufficient to liquefy and uniformly distribute the lubricant within the compressed mixture with the lubricant effecting a uniform distribution of the liquid phase former on the particles of metal powder. (Page 3, lines 12 to 15).

Next, the compressed mixture is sintered at a sintering temperature sufficient to

RECEIVED
CENTRAL FAX CENTER
MAR 21 2007

evaporate and drive off the lubricant and to effect a liquid phase sintering of the liquid phase former with the particles of metal powder to obtain a compressed and sintered product having a density of 99+% of theoretical density. (Page 3, lines 20 to 24).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. Whether claims 1 to 10 are unpatentable over Allroth (US 6,537,489) in view of Ozaki (US 6,236,076) under 35 USC 103(a).

ARGUMENT

Neither Allroth nor Ozaki describes a process in which a metal powder is mixed with a lubricant and a liquid phase former

Process claim 1 requires a step of "mixing particles of a metal powder with a lubricant . . . and at least one liquid phase former to form a mixture". Allroth does not describe or teach the use of a "liquid phase former". In fact, nowhere in Allroth is the term "liquid phase former" used.

Allroth teaches:

> "... it has now been found that **very high green densities** can be obtained by subjecting iron powders or iron based powders having irregularly shaped particles to compaction with the aid of a percussion machine of the type disclosed in the U.S. Pat. No. 6,202,757."
> (col. 2, lines 18 to 23) (emphasis added)

Further, Allroth teaches that the type of powder to be processed may be pure iron powder or a pure iron powder

> "...optionally mixed with **alloying elements** such as phosphorus, copper, nickel, molybdenum, sulphur, chromium, manganese, vanadium, tungsten, cobalt etc. to a total amount of alloying elements of at most 20% by weight of the metal powder. "
> (col. 2, lines 41 to 45). (emphasis added)

Further, Allroth teaches that before compaction the powder may also be mixed

> "...with different additives selected from a group consisting of **graphite**, ferrophosphorus, hard phase materials, machineability enhancing agents, flow enhancing agents, **lubricants**."
> (Column 2, lines 60 to 64). (emphasis added)

Allroth teaches that graphite may be added to the powder to increase mechanical properties (column 2, lines 64 to 66).

Allroth also provides that another alternative is to provide the powder particles with a lubricant coating or film before compaction is performed with the lubricant being selected from metal soaps, waxes and thermoplastic materials. (Column 3, lines 5 to 15).

There is no teaching in Allroth that graphite is a lubricant. Instead, Allroth distinguishes graphite from lubricants (Column 2, lines 60 to 64).

There is no teaching in Allroth that graphite is a liquid phase former. It is known that graphite particles will diffuse while in the solid state into iron particles, i.e. a solid state diffusion, during heating. However, graphite does not form a liquid phase during this solid state diffusion. Claim 1 requires "sintering the compressed mixture at a sintering temperature sufficient to evaporate and drive off said lubricant and to effect a liquid phase sintering of said liquid phase former with said particles of metal powder...". Allroth is void of any such teaching.

Ozaki relates to an iron-based powder composition comprising an iron-based powder, an alloying powder, such as graphite powder, and a lubricant. (col. 1, lines 10 to 14). The graphite powder increases the specific surface area of the powder composition to lower the flowability of the composition. (col. 2, lines 4 to 7). The

lubricant is a fatty acid amide and/or a metal soap (col.4, lines 41 to 42) that includes lauric acid (col. 5, lines 4 to 5). The invention of Ozaki is to provide for higher flowability by coating at least one of the iron-based powder, the alloying powder and the lubricant with at least one surface treatment agent. (col.3, lines 47 to 53).

The Examiner alleges that it would be obvious to use the lubricant of Ozaki as the lubricant in Allroth. No issue is taken in this respect. However, it is to be noted that use of the lubricant of Ozaki does not result in the process of claim 1 since Ozaki is void of any teaching of a "liquid phase former".

In view of the above, a rejection of claim 1 as being unpatentable over Allroth in view of Ozaki under 35 USC 103(a) is not warranted.

The Examiner admits that Allroth does not disclose the term "liquid phase former"

The Examiner admits that the term "liquid phase former" is not specifically disclosed in Allroth but alleges that additives and alloying elements such as graphite, phosphorous and nickel are disclosed. The Examiner then alleges that since the instant specification and claims describe the "liquid phase former" as being one of graphite, phosphorous and nickel, that one of ordinary skill in the art would expect the same effect to occur [in Allroth], that being "to effect a liquid phase sintering of said liquid phase former with said particles of metal powder".

In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990).

"The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993); *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

Allroth teaches that graphite may be added to the powder to increase mechanical properties (column 2, lines 64 to 66). This is not a teaching that the graphite is to be sintered at a temperature to effect a liquid phase sintering of the graphite with particles of metal powder. In the absence of such a teaching, a rejection of claim 1 as being unpatentable over Allroth in view of Ozaki under 35 USC 103(a) is not warranted.

Neither Allroth nor Ozaki describes a process in which a mixture of metal powder, lubricant and a liquid phase former are compressed to effect a uniform distribution of the liquid phase former on the particles of metal powder

Claim 1 requires a step of "compressing the mixture at a pressure sufficient to liquefy and uniformly distribute the lubricant within the compressed mixture with said lubricant effecting a uniform distribution of said liquid phase former on said particles of metal powder". Allroth is void of any such step. Instead, Allroth teaches:

> "In this case the powder particles, optionally in combination with particular additives such as graphite, ferrophosforus, hard phase materials, machinability improving agents, are provided with a lubricant coating or film."
> (col. 4, line 65 to col. 5, line 2)

This is not a teaching in Allroth that the additives are to be uniformly distributed onto the particles of metal powder. Instead, the additives are to be provided with a lubricant coating.

Since Allroth, taken alone or in combination with Ozaki, does not teach the claimed process step, a rejection of claim 1 as being unpatentable over Allroth in view of Ozaki under 35 USC 103(a) is not warranted.

Note is made of the Examiner's allegation at page 4 of the Final Rejection that a uniform distribution of liquid phase formers is a common function of lubricants, as lubricants are used to prevent segregation in powder mixtures citing Ozaki as col. 4, lines 42 to 44. In fact, Ozaki states:

> "This lubricant prevents surely segregation of the iron-based powder composition and dust generation, and improves flowability and compactibility."
> (col. 4, lines 42 to 44).

This is not a teaching that a uniform distribution of liquid phase formers is a common function of lubricants.

Neither Allroth nor Ozaki describes a process that effects a liquid phase sintering of a liquid phase former with particles of metal powder

Claim 1 requires a step of "sintering the compressed mixture at a sintering temperature sufficient to evaporate and drive off said lubricant and to effect a **liquid phase sintering** of said liquid phase former with said particles of metal powder...". (emphasis added).

Neither Allroth nor Ozaki uses the term "liquid phase sintering".

As set forth in applicants' description at page 3, beginning on line 4, the liquid phase former that is used has a characteristic of forming a liquid phase during sintering and of becoming part of the final product after sintering and at page 5, beginning on line 8, and that during the thermal sintering cycle, the surface and surface composition of the metal particle and the liquid phase former form a surface composition that upon further heating will liquefy forming a liquid film and provides surface tension which aids the densification process. This new result is not described or taught by Allroth.

As noted above, it is known that graphite particles will diffuse while in the solid state into iron particles, i.e. a **solid** state diffusion, during heating. However, graphite does not form a liquid phase during this solid state diffusion.

Since Allroth, taken alone or in combination with Ozaki, does not teach the claimed process step, a rejection of claim 1 as being unpatentable over Allroth in view of Ozaki under 35 USC 103(a) is not warranted.

Claim 5

Claim 5 depends from claim 1 and further requires a compaction pressure of 35 to 70 tons per square inch.

Allroth teaches the use of a percussion machine that employs high velocity compaction. There is no teaching of the compaction pressure. Of note, US Patent 6,202,757 is referenced at col.3, line 25 of Allroth as disclosing a percussion machine to perform the process of Allroth does not describe or teach any compaction pressure.

The Examiner has not presented any evidence that routine experimentation would result in using a compaction pressure of 35 to 70 tons per square inch in the percussion machine of Allroth that relies on ram speed. In fact, Allroth states:

> "No straight equivalence exists between compaction pressure in a conventional press and the ram speed."
> (col. 3, lines 48 to 50)

Accordingly, a rejection of claim 5 as being unpatentable over Allroth in view of Ozaki is not warranted pursuant to the provisions of 35 USC 103(a).

Claim 7

Claim 7 depends from claim 1 and further recites that the compaction pressure is greater than 45 tons per square inch. Again, there is no such teaching in Allroth or US Patent 6,202,757.

Claims 2 to 4, 6 and 8 to 10

Claims 2 to 4, 6 and 8 to 10 depend from claim 1 and stand or fall with claim 1.

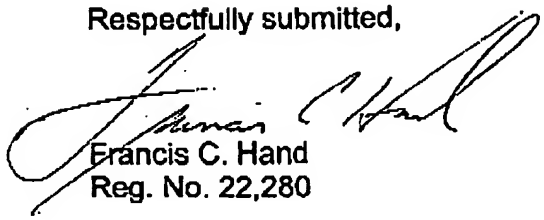
SUMMARY

For the reasons set forth above, the Final Rejection of claims 1 to 10 should not be sustained.

USSN 10/724,248
Art Unit 1742

The application is believed to be in condition for allowance and such is respectfully requested.

Respectfully submitted,



Francis C. Hand
Reg. No. 22,280

CARELLA, BYRNE BAIN, GILFILLAN,
CECCHI, STEWART & OLSTEIN
Five Becker Farm Road
Roseland, NJ 07068
Phone: 973-994-1700
Fax: 973-994-1744

APPENDIX

1. A process comprising the steps of

mixing particles of a metal powder with a lubricant having a characteristic of becoming liquid under pressure and of evaporating under a sintering temperature and at least one liquid phase former to form a mixture;

compressing the mixture at a pressure sufficient to liquefy and uniformly distribute the lubricant within the compressed mixture with said lubricant effecting a uniform distribution of said liquid phase former on said particles of metal powder; and

sintering the compressed mixture at a sintering temperature sufficient to evaporate and drive off said lubricant and to effect a liquid phase sintering of said liquid phase former with said particles of metal powder to obtain a compressed and sintered product having a density of 99+% of theoretical density.

2. A process as set forth in claim 1 wherein said metal powder is a ferrous metal powder.

3. A process as set forth in claim 1 wherein said lubricant is one of APEX PS1000b, lauric acid and Johnson's Floor Wax.

4. A process as set forth in claim 1 wherein said liquid phase former is at least one of synthetic graphite, nickel, boron, phosphorous and compounds of boron and phosphorous.

5. A process as set forth in claim 1 wherein said mixture is compressed under a compaction pressure of 35 to 70 tons per square inch.

6. A process as set forth in claim 1 wherein said mixture is compressed through high velocity compaction.

7. A process as set forth in claim 1 wherein said mixture is compressed under a compaction pressure greater than 45 tons per square inch.

8. A process as set forth in claim 1 wherein said compressed mixture is sintered at a temperature in the range of from 2070 to 2500° with the preferred range being 2300 to 2500 F.

9. A process as set forth in claim 1 wherein said compressed mixture is sintered at a temperature in the range of from 2300 to 2500° for a time of from 10 to 60 minutes.

10. A process as set forth in claim 1 wherein said step of compressing includes placement of the mixture in a tool whereby during compressing of the mixture into a green compact the liquefied lubricant forms a liquid film between the tool and the mixture to cause a green compact with a uniform density gradient to be obtained.

#312388